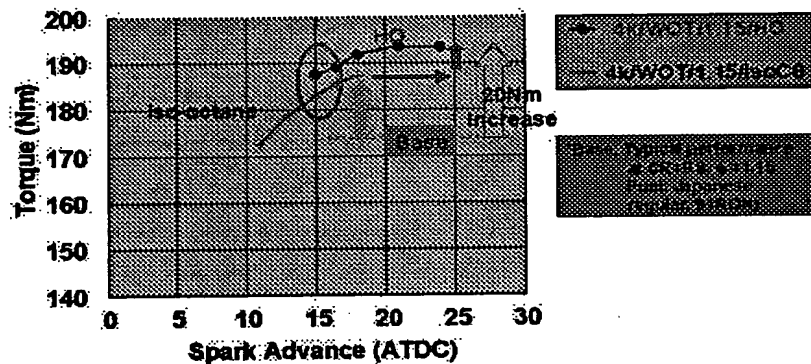


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Figure 1: Torque Performance (4000WOT, CR=13)

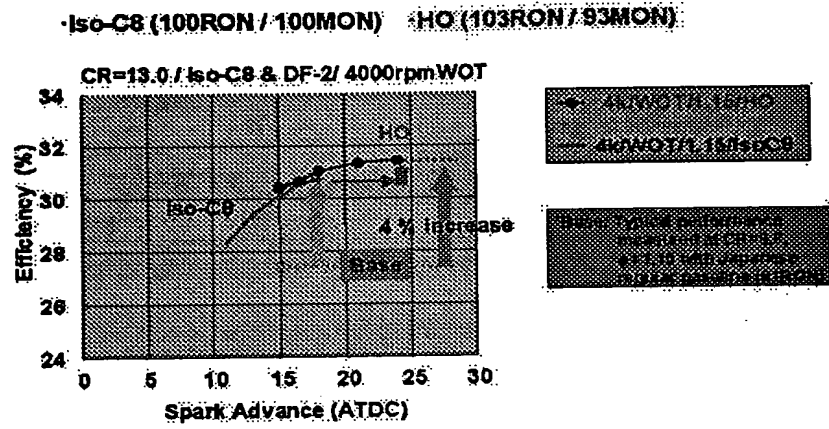
Iso-C8 (100RON / 100MON) Fuel "HO" (103RON / 93MON)



Fuel HO reaches MBT

Torque jump at constant SA → Effect of enhanced burn rate

Figure 2: Efficiency(4000WOT,CR=13)



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Figure 3: Burn Rate and Heat Release Rate

(4000WOT, CR=13, $\phi=1.15$, SA=16.5)

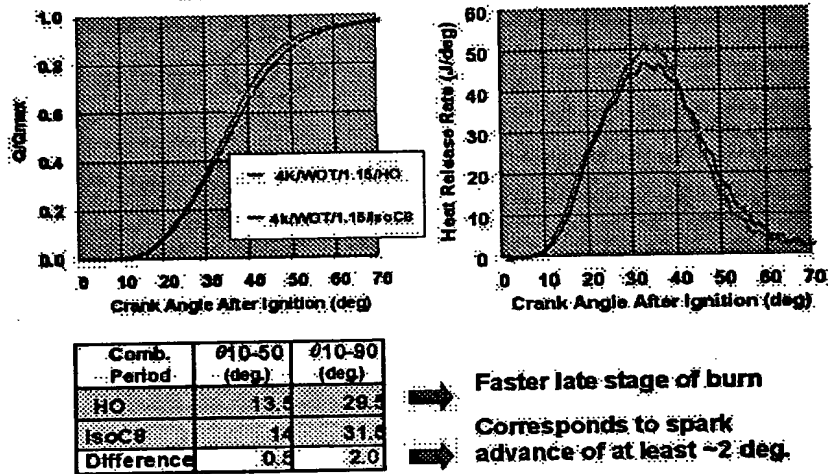


FIGURE 4

1200 rpm, 12mm3/st: Inj. Timing Dependence - Torque -
 Spark Timing: 23 deg BTDC

◆ LFG-2B/13/ ϕ 0.52
 ■ DF-1/13/ ϕ 0.52
 ○ LFG-2B/9.8/ ϕ 0.52/TMC Data

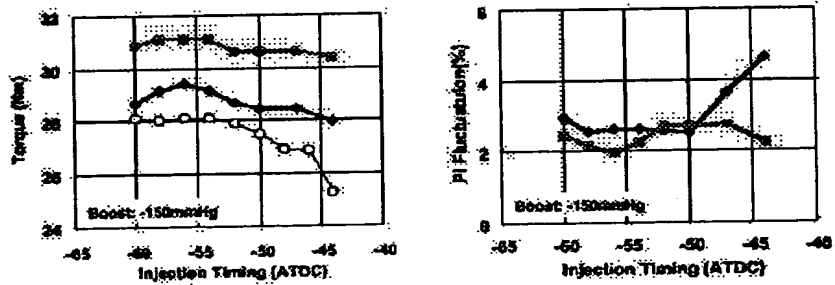


FIGURE 5

1200 rpm, 12mm3/st: Inj. Timing Dependence - Emissions -
Spark Timing: 23 deg BTDC

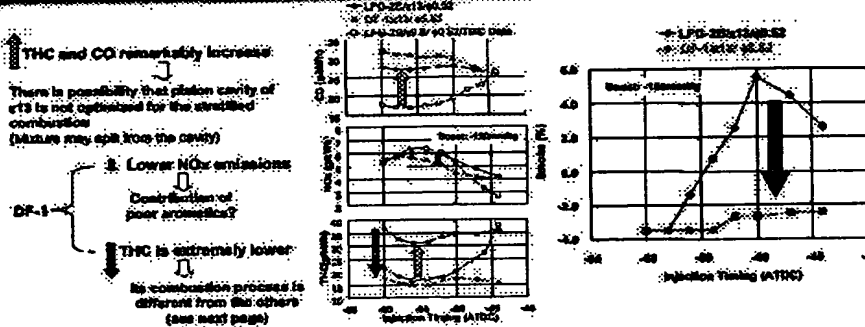
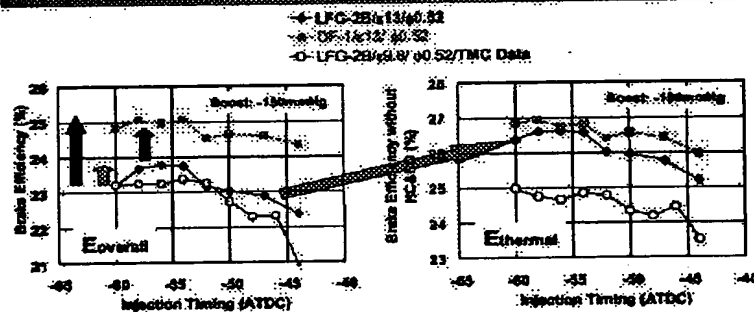


FIGURE 6

1200rpm, 12mm3/st: Inj. Timing Dependence - Efficiencies -
Spark Timing: 23 deg BTDC



Efficiency: 29.8 → 31.3 ~1.5% UP

LFG-2B → DF-1 ~5.5% UP

Total ~7% UP

Note: Credit from the base (29.8) is expedient value because the base data were measured at TMC bench with another engine.

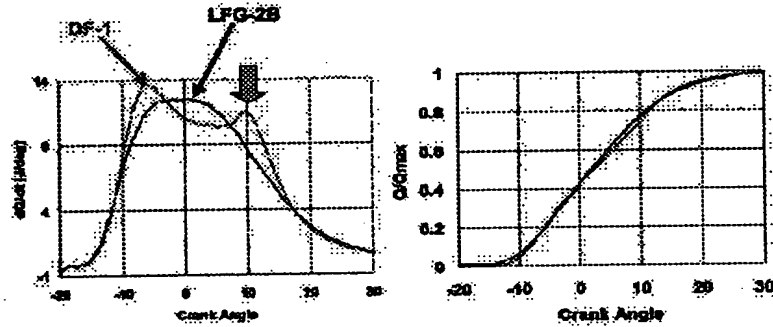
The brake efficiency of #13 series is deteriorated by its higher THC and CO emissions

Combination of SACI and low RON aromatics poor fuel is effective for high compression D4

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FIGURE 7

1200 rpm, 12mm3/st: Heat release patterns
Spark Timing: 23 deg BTDC, Inj Timing: 54 deg BTDC



In the case of DF-1 with ϕ_{13} , SIC (Spark Induced Compression Ignition) is occurred.

FIGURE 8

3000 rpm, 18mm3/st: Inj Timing Dependence - Emissions -

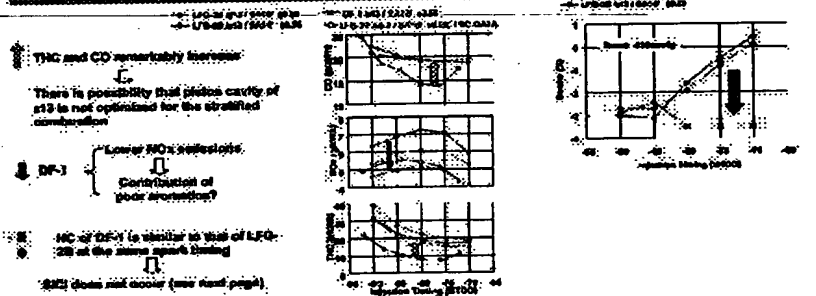
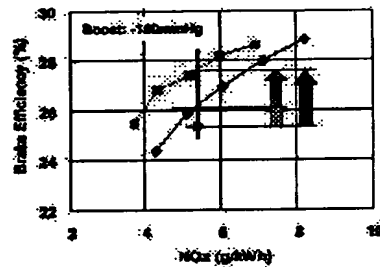


FIGURE 9

3000rpm, 18mm³/st : Credit in Efficiency
Injection Timing: 80 deg BTDC

- ◆ LFG-2B #13 / Inj80/ $\phi 0.56$
- DF-1 #15 / Inj80/ $\phi 0.56$
- LFG-2B #9.6 / Inj80/ $\phi 0.56$ / TMC DATA



Efficiency:

$\phi 9.6 \Rightarrow 13 \sim 3\% \text{ UP}$

LFG-2B \Rightarrow DF-1 $\sim 5\% \text{ UP}$
(not under equivalent NOx level)

Total $\sim 8\% \text{ UP}$

Above credit is not universal

It is not better way to retard
spark timing in order to reduce
NOx emissions

FIGURE 10

2400 rpm, 24mm³/st : Inj Timing Dependence - Emissions

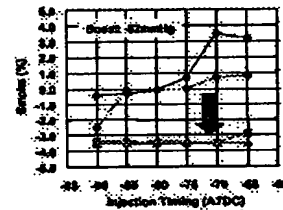
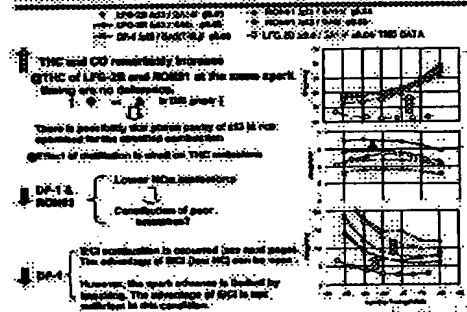
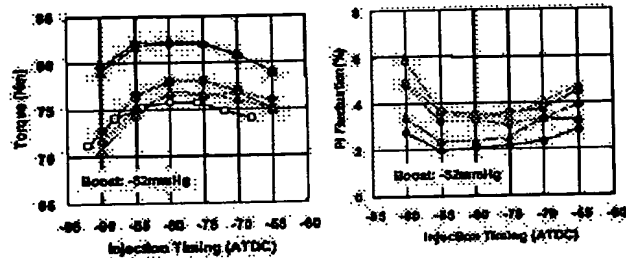


FIGURE 11

2400 rpm, 24mm³/st: Inj. Timing Dependence - Torque -
Equivalent Boost and ϕ

- LFG-2B / ϵ 13 / SA14/ ϕ 0.63
- LFG-2B / ϵ 13 / SA9/ ϕ 0.63
- DF-1 / ϵ 13 / SA9(TKLY) ϕ 0.63
- RON91 / ϵ 13 / SA14/ ϕ 0.63
- RON91 / ϵ 13 / SA9/ ϕ 0.63
- LFG-2B / ϵ 9.8 / SA14/ ϕ 0.64/TMC DATA

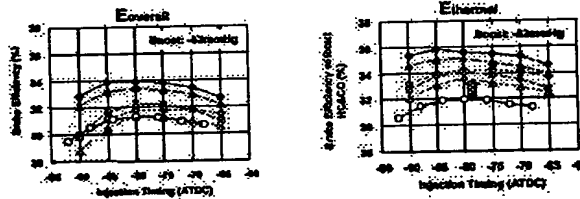


ϵ 13 series shows higher torque.

FIGURE 12

2400rpm, 24mm³/st: Inj. Timing Dependence - Efficiencies -

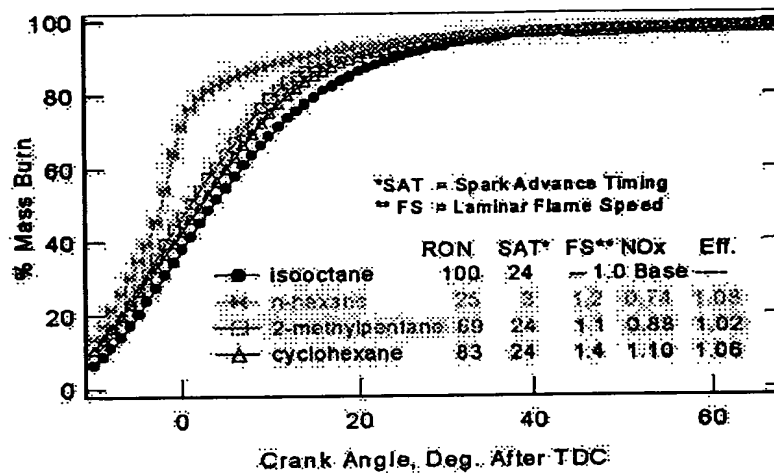
- LFG-2B / ϵ 13 / SA14/ ϕ 0.63
- LFG-2B / ϵ 13 / SA9/ ϕ 0.63
- DF-1 / ϵ 13 / SA9(TKLY) ϕ 0.63
- RON91 / ϵ 13 / SA14/ ϕ 0.63
- RON91 / ϵ 13 / SA9/ ϕ 0.63
- LFG-2B / ϵ 9.8 / SA14/ ϕ 0.64/TMC DATA



Credit in efficiency will be discussed on later page.

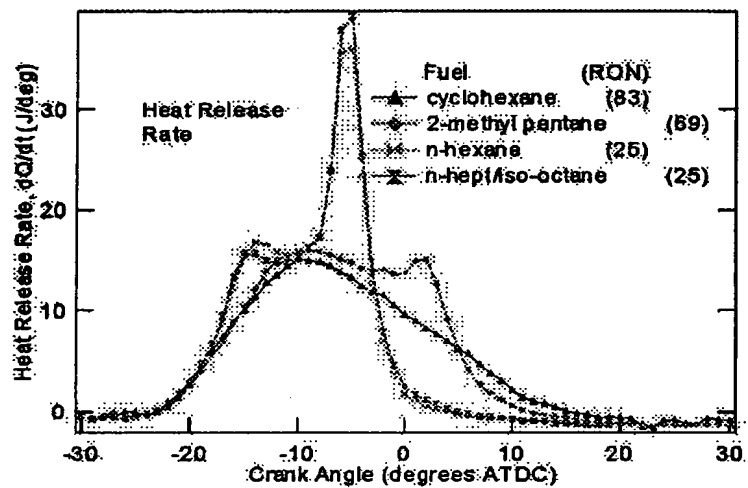
The brake efficiency of ϵ 13 series is deteriorated by its higher THC and CO emissions.

FIGURE 13



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FIGURE 14



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